U.S. Department of Energy
Office of River Protection
Mr. R. J. Schepens
Manager
P.O. Box 450, MSIN H6-60
Richland, Washington 99352

CCN: 035820

Dear Mr. Schepens:

CONTRACT NO. DE-AC27-01RV14136 – TRANSMITTAL FOR IMFORMATION: AUTHORIZATION BASIS CHANGE NOTICE 24590-WTP-ABCN-ESH-02-020, REVISION 0, *CHANGE TO A PROPOSED AB DOCUMENT - REVISION TO THE BOF PSAR ADDING FACILITIES/SYSTEMS TO THE CONSTRUCTION AUTHORIZATION REQUEST*

Bechtel National, Inc. (BNI) is providing Authorization Basis Change Notice (ABCN), 24590-WTP-ABCN-ESH-02-020, Revision 0, to the U.S. Department of Energy, Office of River Protection and the Office of Safety Regulation (OSR) for information (attached). This ABCN adds the Glass Former Storage Facility to the Preliminary Safety Analysis Report to Support Construction Authorization; Balance of Facility Specific Information (BOF PSAR) (24590-WTP-PSAR-ESH-02-002-05).

An electronic copy of ABCN 24590-WTP-ABCN-ESH-02-020, Revision 0, is provided for the OSR's information and use.

Please contact Mr. Bill Spezialetti at (509) 371-4654 for any questions or comments.

Very truly yours,

R. F. Naventi
Project Director

CO/slr

Attachment: Authorization Basis Change Notice (ABCN), 24590-WTP-ABCN-ESH-02-020, Revision 0, plus attachments

DOCUMENT INFORMATION

Please complete the following information when submitting a document to PDC.

Correspondence (CCN) No: 035820	**Rev: N/A**
Document No: 24590-WTP-ABCN-ESH-02-020	**Rev:** 0

Project Information (Check Applicable Box)

- ☐ Balance of Facilities
- ☐ Pretreatment
- ☐ HLW Vitrification
- ☐ LAW Vitrification
- ☐ Analytical
- ☐ External Interfaces
- ☒ Across all areas

Document is applicable to ALARA? ☐ Yes ☒ No

In general, any record that deals with Radiation, Radioactive Material, Occupational Dose, Dose Reduction, or Dose Rate are considered ALARA Records. (See 24590-WTP-GPP-SRAD-002, *Application of ALARA in the Design Process*, section 4.8 for additional guidance)

Additional Information for Correspondence

Subject Code(s) 4152

Action Item Information. (This section does not apply to Meeting Minutes.)

☒ No Action Item within the correspondence

☐ Action(s): (Give a brief description of actions in the following space [optional])

Due Date: ____________ (If no due date is indicated, a 2-week period will be assigned.)

Action Owed to: ____________

Actionee(s)

This correspondence closes action on Correspondence Number ____________

☐ Subcontract Files ________ Copies

☐ PAAA Coordinator MSII-B

☐ Contains SENSITIVE Information

12/26/02 12/26/02 12/26/02

☒ Processed/ Data Entry ☒ Copied/ QA ☒ Scanned ☐ Filed

12/26/02

Authorization Basis Change Notice

ABCN Number 24590-WTP-ABCN-ESH-02-020 12/3/02 Revision 0

ABCN Title: Change to a ~~Proposed~~ a c.o. AB Document - Revision to the BOF PSAR adding facilities/systems to the Construction Authorization Request

I. ABCN Review and Approval Signatures

A. ABCN Preparation

ISSUED BY RPP-WTP PDC
INIT 12/26/02 DATE

	Print/Type Name	Signature	Date
Preparer:	Carl Ortiz	Carl Ortiz	c.o. 12/3/02 8/21/02
Reviewer:	Todd Allen		TA 12/3/02 8/26/02

B. Required Reviewers

Review Required? *For each person checked, that signature block must be completed.*

Review Required?	Role	Print/Type Name	Signature	Date
☒	ES&H Manager	Fred Beranek		9/18/02 12/3/02
☒	QA Manager	George Shell	George Shell	9/23/02 12/4/02
☒	PSC Chair	Bill Poulson		10/02/02 12/17/02
☒	Commissioning/Training Manager	Neil Brosee	Rodney ... for Neil Brosee	9-23-02 12-13-02
☒	Engineering Manager	Fred Marsh	S... for FM	9/23/02 12/5/02
☒	Construction Manager	Bill Clements	WJC	9/19/02 WJC 12/12/02
☒	Area Project Manager	J. Q. Hicks		9/20/02 JQH 12/9/02
☐	Research & Technology Manager	N/A		
☐	PMT Chair	N/A		
☐	Other Affected Organization	N/A		
☐	Other Affected Organization	N/A		
☐	Other Affected Organization	N/A		

C. ABCN Approval

	Print/Type Name	Signature	Date
WTP Project Manager	Ron Naventi	... for RN	12/24/02

Authorization Basis Change Notice

ABCN Number 24590-WTP-ABCN-ESH-02-020 Revision 0

ABCN Title Change to a AB Document - Revision to the BOF PSAR adding facilities/systems to the Construction Authorization Request

II. Description of the Proposed Change to the Authorization Basis

D. Affected AB Documents:

Title	Document Number	Revision
Preliminary Safety Analysis Report to Support Construction Authorization; Balance of Facility Specific Information	24590-WTP—PSAR-ESH-01-002-05	0

Decision to Deviate ☐ Yes ☒ No

If yes, DTD Number/Revision ____________ DTD Closure Date:

Initiating Document Number/Revision ____________ ____________

E. Describe the proposed changes to the Authorization Basis Documents:

This change is to a AB document. The change adds the Glass Former Storage Facility to the BOF PSAR. Chapters 2 and 3 of the BOF PSAR are changed. See attachment 1 and 2 of this ABCN for details of the changes.

F. List associated ABCNs and AB documents, if any:

There are no other ABCNs or AB documents associated with this change. This change, to a AB document, maintains consistency with the rest of the AB.

G. Explain why the change is needed:

This change is needed in order to request/support construction authorization of the Glass Former Storage Facility.

H. List the implementation activities and the projected completion dates:

Activity	Date
Inform DOE that AB has been revised and formally transmit electronic version	30 days or less from ABCN approval
Distribute revised controlled copy pages / update WTP Library	30 days from ABCN approval

Revise the following implementing documents:

Documents	Describe extent of revisions	Date
1		
2		

ABCN Number 24590-WTP-ABCN-ESH-02-020 Revision 0

ABCN Title Change to a AB Document - Revision to the BOF PSAR adding facilities/systems to the Construction Authorization Request

Describe other activities: **Date**

1 This change is against a AB document (PSAR). The readiness assessment for implementing this PSAR will identify potential requirements that need to be implemented in lower tier documents.

2

III. Evaluation of the Proposed Change

I. Is DOE approval required? Answer questions for Administrative Control changes OR Facility changes, not both.

For an Administrative Control change: **Yes** **No**

1. Does the revision involve the deletion or modification of a standard previously identified or established in the SRD? ☐ ☐

   Explain:

2. Does the revision result in a reduction in commitment currently described in the AB? ☐ ☐

   Explain:

3. Does the revision result in a reduction in the effectiveness of any procedure, program, or plan described in the AB? ☐ ☐

   Explain:

For a Facility (technical) change: **Yes** **No**

1. Does the revision involve the deletion or modification of a standard previously identified or established in the SRD? ☐ X

   Explain:

   This change adds the Glass Former Storage Facility to the Chapter 2 and Chapter 3 of the BOF PSAR, therefore does not delete or modify any standard previously identified or established in the SRD.

2. Does the revision create a new Design Basis Event (DBE)? ☐ X

   Explain:

   The WTP Integrated Safety Management (ISM) process evaluated the hazards associated with the addition of the Glass Former Storage Facility to the BOF PSAR. The ISM process determined that only industrial type hazards exist in the Glass Former Storage Facility, and no new DBEs are created.

3. Does the revision result in the more than a minimal increase in the frequency or consequence of an analyzed DBE as described in the Safety Analysis Report? ☐ X

   Explain:

ABCN Number 24590-WTP-ABCN-ESH-02-020 Revision 0

ABCN Title Change to a AB Document - Revision to the BOF PSAR adding facilities/systems to the Construction Authorization Request

The ISM process determined that only industrial type hazards exist in the Glass Former Storage Facility; therefore, the addition of the Glass Former Storage Facility to the BOF PSAR can not affect the frequency or consequence of an analyzed DBE described in the BOF PSAR or any other AB document.

4. Does the revision result in more than a minimal decrease in the Safety Functions of important-to-safety SSCs or change how a Safety Design Class SSC meets its respective safety function? ☐ X

   Explain:

   The ISM process determined that only industrial type SSCs and controls are necessary based the hazards that exist in the Glass Former Storage Facility; therefore, this change will not decrease in the Safety Functions of important-to-safety SSCs or change how a Safety Design Class SSC meets its respective safety function.

J. Complete the safety evaluation by describing how the revision to the AB:

1. will continue to comply with all applicable laws and regulations (e.g., 10 CFR 830, 10 CFR 835), conform to top-level safety standards (e.g., DOE/RL-96-0006), and provide adequate safety.

   This change adds the Glass Former Storage Facility to the BOF PSAR. These additions summarize the results that have been evaluated per the WTP Integrated Safety Management (ISM) process. The BOF PSAR, including this change, continues to comply with applicable laws and regulations, conform to top-level safety standards, and provide adequate safety.

2. will continue to conform to the contract requirements associated with the authorization basis document(s) affected by the revision.

   This change is against a AB document (BOF PSAR) and will continue to conform to the original submittal requirements.

3. will not result in inconsistencies with other commitments and descriptions contained in portions of the authorization basis or an authorization agreement not being revised.

   This change is against a AB document the BOF PSAR. This change to a AB document maintains consistency with the rest of the AB and adds description of facilities committed to in the ISAR as planned in the phased submittal approach.

K. Justification of the Proposed Change

If the change requires DOE approval, provide a justification that demonstrates that the proposed change is safe.

This change adds the Glass Former Storage Facility to the BOF PSAR. These additions summarize the results that have been evaluated per the WTP Integrated Safety Management (ISM) process. The AB document, including this change, continues to comply with applicable laws and regulations, conform to top-level safety standards, and provide adequate safety.

ABCN Number 24590-WTP-ABCN-ESH-02-020 Revision 0

ABCN Title Change to a AB Document - Revision to the BOF PSAR adding facilities/systems to the Construction Authorization Request

L. Certification of Continued SRD Adequacy

Based on evaluations from III.I, if either question III.I.1 is marked "Yes", Project Manager certification is required. The Project Manager's signature certifies that the revised SRD continues to identify a set of standards that provides adequate safety, complies with WTP applicable laws and regulations, and conforms with top-level safety standards and principles. This certification is based on adherence to the DOE/RL-96-0004 standards identification process and successful completion of review and confirmation by the PSC.

WTP Project Manager:	N/A		
	Print/Type Name	*Signature*	*Date*

Authorization Basis Change Notice

ABCN Number 24590-WTP-ABCN-ESH-02-020 Revision 0

ABCN Title Change to a AB Document - Revision to the BOF PSAR adding facilities/systems to the Construction Authorization Request

M. List of Attachments

1. Copies of the affected AB document(s) or appropriate excerpt(s) showing the proposed revision(s).

   Attachment 1, Revised document - Preliminary Safety Analysis Report to Support Construction Authorization; Balance of Facility Specific Information (24590-WTP-PSAR-ESH-01-002-05)

   Attachment 2, Summary of document changes

24590-WTP-ABCN-ESH-02-020 Rev 0

Attachment 1

Revised Document
Preliminary Safety Analysis Report to Support Construction Authorization; Balance of Facility Specific Information
(24590-WTP-PSAR-ESH-01-002-05)

Document Part	Title	Starting Page	No. of Pages
Chapter 2	Facility Description	2-i	19
Chapter 3	Hazard and Accident Analysis	3-I	26

# of pages (including cover sheet): 46

2 Facility Description

Contents

Appendices

2 Facility Description

2.1 Introduction

The balance of facilities (BOF) will consist of the facilities and systems listed below, including support facilities for radiological waste processing. Two of the facilities, the wet chemical storage building and the glass former storage facility, will contain process chemicals. Other BOF structures, including the water treatment facility and the steam plant and the cooling tower facility, will contain chemicals involved with water treatment that are not associated with waste processing.

2.1.1 Definition of the Balance of Facilities

The BOF will be a collection of support facilities and systems not directly involved with the processing or vitrification of radiological material. Facilities and systems listed below marked (not included) are not part of this construction authorization request, are not described in this document, and will be provided in later CAR submittals.

- Utility distribution systems
- Switchgear building
- BOF switchgear building
- Important to safety (ITS) switchgear building
- Administration building
- Chiller/compressor plant
- Water treatment building and storage tanks
- Cooling tower facility
- Fire water pump house and fire water storage tanks
- Non-dangerous, non-radioactive (NDNR) liquid effluent facility
- Access control facility
- Simulator facility
- Warehouse
- Steam plant (not included)
- Wet chemical storage facility (not included)
- Glass former storage facility ~~(not included)~~
- Encapsulation facility (not included)
- Diesel generator facility (includes both standby and emergency diesel generators) (not included)
- Fuel oil facility (not included)
- Waste buildings (failed melter storage, spent melter staging area, central waste storage) (not included)
- Melter assembly building (not included)

2.2 Requirements

The principal requirements for the BOF ITS structures, systems, and components (SSCs) are in the General Information Volume (*Preliminary Safety Analysis Report to Support Construction Authorization, General Information,* 24590-WTP-PSAR-ESH-01-002-01). The safety requirements and top level codes and standards applicable to the design of ITS SSCs are in Chapter 4 of the *Safety Requirements Document* (SRD), (24590-WTP-SRD-ESH-01-002-02). These codes and standards are confirmed using the approach in SRD Appendix A, "Implementing Standard for Safety Standards and Requirements Identification." Codes and standards used in the design of specific systems are documented in Chapter 4, "Important to Safety Structures, Systems, and Components."

Codes and standards identified for non-ITS SSCs may be regarded as the minimum set of requirements. See *Determination of Quality Levels* (24590-WTP-3DP-G04T-00905), Appendix A, section 1.0, Grading Process.

2.3 Overview

The following sections describe the BOF facilities and their projected uses, configuration, and the basic processes performed therein. Figure 2A-1 shows the general layout of the River Protection Project - Waste Treatment Plant (WTP) site and the location of the BOF facilities.

2.4 Structures

Most of the BOF structures do not provide ITS functions. Those with ITS functions are identified in this section with their design requirements. The structural design of the non-ITS structures is in accordance with their seismic category (SC), either SC-III or SC-IV. The applicable facility structural design codes and standards are in SRD sections 4.1-3 and 4.1-4 for SC-III, and *Basis of Design* (24590-WTP-DB-ENG-01-001), for SC-IV. These categories share the following design standards:

UBC	*Uniform Building Code*
ASCE 7	*Minimum Design Loads for Buildings and Other Structures*
AISC M016	*Manual for Steel Construction - Allowable Stress Design*
ACI 318	*Building Code Requirements for Structural Concrete*

The BOF structure described below has been identified with ITS functions. The hazard analyses have identified the seismic categorization of this facility. The design requirements are in accordance with the General Information volume, section 2.4. The seismic categorization and specific codes and standards applied to the structural design and construction of the BOF ITS building follow.

ITS Switchgear Building and Equipment Anchorage

The ITS switchgear building is a steel building, supported on and anchored to a reinforced concrete foundation system. Primary framing is a steel structure, with rigid framing and bracing systems fabricated with structural mill sections or welded built-up plate sections and designed in accordance with AISC N690.

The switchgear equipment is categorized SC-I. To protect this SC-I equipment, the building is categorized as SC-II. The corresponding requirement for design for other natural phenomena hazards is Performance Category 3 (PC-3).

Codes and standards applied to the structural design and construction of the ITS switchgear building are identified in the SRD, Safety Criterion 4.1-3, and are summarized below.

ASCE 4	*Seismic Analysis of Safety-Related Nuclear Structures*
ASCE 7	*Minimum Design Load for Buildings and Other Structures*
ACI 349	*Code Requirements for Nuclear Safety-Related Concrete Structures*
ANSI/AISC N690	*Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities*

In accordance with the General Information volume, this building is designed for dynamic seismic loads. The ITS switchgear building is a one-story steel frame building supported by a system of concrete footings with a below-grade reinforced concrete vault. Because of the structure's simplicity, the effects of dynamic amplification of the structure and interaction with the dynamic soil properties, a System for Analysis of Soil-Structure Interaction (SASSI) analysis will not be performed. These effects are addressed by conservative methods specified in American Society of Civil Engineers (ASCE) 4. The underground reinforced concrete vault will be evaluated with appropriate dynamic lateral soil loads that result from the surcharge loads of the ITS building and induced seismic forces.

The reinforced concrete slab and foundation systems are designed in accordance with ACI 349 requirements. Anchorage for the SC-I equipment is designed in accordance with ACI 349, Appendix B.

The design of the ITS switchgear equipment is in accordance with ASCE 4. The floor response spectra used for design of this equipment is the specified ground response. There is no amplification of this response from the flexibility of the structural system and elements.

2.5 Process and Operations Description

The BOF facilities and systems in this submittal are not directly related to the Hanford waste tank immobilization process.

2.6 Confinement Systems

The BOF facilities and systems in this submittal are not directly related to the Hanford waste tank immobilization process. No confinement systems have been identified for this submittal.

2.7 Safety Support Systems

A safety support system performs safety support that is not part of specific processes (such as criticality monitoring, radiological monitoring, chemical monitoring, and effluent monitoring). There are no safety support systems for the BOF structures and systems in this submittal.

2.8 Utility Distribution Systems

The following subsections address the major components or systems of the site electrical distribution system (normal, standby, and ITS power supply systems). The design standards for these electrical systems are in the General Information volume, section 2.8, Utility Distribution System. The normal power supply systems will consist of the 13.8 kV supply system, the switchgear building, the 4.16 kV supply system, and the BOF switchgear building. Standby and emergency power is supplied by the diesel generator facility. Details will be provided in a later submittal. The ITS supply system will consist of the 4.16 kV emergency switchgears in the ITS switchgear building and the emergency diesel generators (EDGs) in the diesel generator facility. Figure 2A-2 shows the overall electrical single line diagram for all facilities at the WTP site.

The General Information volume, section 2.8, further discusses the WTP electrical distribution system.

2.8.1 Site Electrical Services

The WTP electrical system will receive power from the Hanford Site 230 kV transmission system. The Department of Energy (DOE) will modify this system and loop it into a new 230 kV substation with two 230-13.8 kV transformers.

2.8.2 13.8 kV Supply System

The 13.8 kV power to the WTP site will be provided via the DOE site substation (Figure 2A-2). The DOE site substation will consist of two 13.8 kV power transformers supplied from two separate offsite 230 kV power lines. The DOE transformers will provide electrical power to the WTP main switchgear. The four main feeder cables will be routed from the 13.8 kV feeder breakers in the DOE switchgear via four concrete encased underground ducts to the WTP main 13.8 kV switchgears in the switchgear building. Figure 2A-3 is a one-line diagram of the electrical supply system from the distribution grid to the building.

2.8.3 Standby Power, Non-ITS

This information is to be provided in a later submittal.

2.8.4 Emergency Power, ITS

The DOE-supplied 13.8 kV electrical substation distributes the power to the site 13.8 kV system switchgears and from there to the 4.16 kV emergency switchgears via step-down transformers. The three 4.16 kV emergency switchgears power the three 480 V emergency motor control centers (MCC) via step-down transformers. The EDGs also power the 4.16 kV emergency switchgears on loss of offsite power. Figure 2A-3 shows the three trains of ITS equipment. There are three independent and redundant trains of ITS power systems in the ITS switchgear building.

- Three sets of ITS 4.16 kV switchgears
- Three sets of ITS 480 V MCCs
- Three sets of ITS 125 V DC systems
- Three sets of ITS UPS systems

Electrical Duct Bank

The electrical duct bank is a reinforced concrete structure encasing polyvinyl chloride (PVC) electrical conduits. The ITS duct bank has been determined to be SC-II to ensure that cables remain functional during and after a seismic event. The duct bank is designed to preclude excessive deformations that would compromise the functionality of the encased cable. The duct bank will be evaluated in accordance with ASCE methodology for seismic loads and structural mechanics for deformations.

2.8.5 Uninterruptible Power Supply Systems

Loads requiring a continuous source of electric power will be powered by a battery-backed uninterruptible power supply (UPS). The UPS will be powered from an 480 V AC bus backed up by EDGs. Therefore, the incoming power supply to the UPS would be restored within the time limits established for the 4.16 kV EDG to automatically start and load. The UPS system will include a rectifier/charger, a static inverter, AC static transfer switch, a hardwired maintenance bypass switch, distribution panels, a step-down transformer, and a bypass alternate source of power.

Most of the UPS loads will be limited to instrumentation loads sensitive to power interruption and emergency lighting, but may include other loads/systems as necessary. The UPS loads include, as a minimum, the following:

- Main control system
- Melter control system
- Control room emergency operating lighting
- Radiological surveillance system
- Stack discharge monitors
- Effluent discharge monitors
- Public address and evacuation system
- Feed tracking system
- Building access control system

A minimum of two UPS systems will be provided per process building (one per load group, specifically, A and B), three ITS UPS systems in the ITS switchgear building (one per EDG) and two non-ITS UPS systems in the BOF switchgear building. At least one non-ITS UPS system will be provided in the administration building to service information technology loads. Power to the UPS systems will be derived from emergency power 480 V MCCs feeding the UPS battery charger. Battery chargers for UPS systems serving information technology servers will be fed from the normal supply system. Some systems, such as the building evacuation system, may have dedicated UPS systems. The above control systems will be fed from two separate and independent UPS systems. UPS loads will also include control room emergency operating lighting.

In addition, the UPS batteries in the ITS switchgear building provide ITS power to the same trains of ITS switchgear, to switch over from offsite power to onsite emergency power if required.

The ITS UPS batteries (in the ITS switchgear facility) will be maintained within their specified temperature range. HVAC for the ITS UPS system will be capable of maintaining the batteries within their specified operating range.

2.8.6 Switchgear Building

The switchgear building will support normal power operations (non-ITS). The building will house the normal power switchgears consisting of seven 13.8 kV switchgears.

2.8.7 BOF Switchgear Building

The BOF switchgear building will support normal power supply (not ITS) to the BOF facilities in the plant. The building will house four 4.16 kV switchgears and four 480 V unit substations.

2.8.8 Diesel Generator Facility

This information is to be provided in a later submittal.

2.9 Auxiliary Systems and Support Facilities

This section describes the auxiliary systems and support facilities not identified or discussed in other sections of the PSAR. These support SSCs are designated non-ITS and provide no ITS functions required to mitigate any accidents. However, these systems provide support to normal operations of the WTP work activities and worker comfort, security, and safety.

2.9.1 Administration Building

The administration building will be an office building used to house the daily engineering, operations, management, and administrative activities of the WTP project.

The administration building does not contribute to potential hazards or to the prevention or mitigation of hazards. Equipment in the building does not perform safety functions related to facility operations. Therefore, the administration building is non-ITS. Construction of the administration building has been authorized within the scope of the *Limited Construction Authorization Agreement* (DOE 2001).

2.9.2 Chiller/Compressor Plant

The chiller/compressor plant facility will house major equipment for the plant service air system, instrument service air system, and chilled water system, that provide utility services for the WTP. The systems include equipment and piping in the chiller/compressor plant and the yard distribution piping up to the battery limits (5 ft distance) of process buildings and other support facilities. The process buildings include the pretreatment (PT), low-activity waste (LAW), and high-level waste (HLW) facilities. Figure 2A-4 shows the general arrangement of the chiller/compressor plant.

The BOF scope of compressed air systems includes plant service air and instrument service air. This system provides a continuous supply of clean, dry air in the proper quantity and pressure to the process buildings (PT, HLW, and LAW) and other support facilities of the plant. The major components of the system consist of air compressors, dryers, and receivers (Figure 2A-5).

Each process building has its own compressed air distribution system, which receives air from the BOF systems and distributes it to various points of application in the building. The facility-specific volumes discuss the distribution systems in these facilities.

This utility does not present a radiological or chemical hazard and (based on integrated safety management [ISM] assessments) is not required for the prevention or mitigation of any radiological or chemical hazards associated with the WTP. Additional compressed air required to support ITS functions will be provided by dedicated air supplies independent from the BOF compressed air system. The compressed air system is therefore non-ITS.

The BOF chilled water system provides a continuous supply of chilled water in the proper quantity, pressure, and temperature to the process buildings (PT, HLW, and LAW) and other plant support facilities. The system will be a closed loop. Separate primary and secondary circuits in the process facilities will be provided as part of the process facility design for cooling circuits associated with equipment in contact with radioactive material. The major components of the system consist of package chiller units and distribution pumps (Figure 2A-6).

This utility does not present a radiological or chemical hazard and, based on ISM assessments, is not required for the prevention or mitigation of any radiological or chemical hazards associated with the WTP. Chilled water requirements to support ITS functions are provided by dedicated systems in the process facilities that are independent from the BOF chilled water system. The BOF chilled water system is therefore, non-ITS.

2.9.3 Water Treatment Building and Storage Tanks

The water treatment building (Figure 2A-7) will provide process service water, demineralized water, and domestic water to the WTP through underground distribution piping. Softened process service water will be supplied to the steam plant for boiler makeup. Chemical storage and metering pumps to treat plant cooling water are also housed in the water treatment building. The water treatment building is designated non-ITS. Figure 2A-8 illustrates process flow of the water treatment supply systems.

The water treatment building will house the process service, domestic, and demineralized water equipment needed for the plant. Chemical storage and metering equipment treats plant cooling water. The building will provide weather protection for the equipment and provides a controlled environment that supports the operation and maintenance of the equipment.

The building will be NDNR, and as such will not require special design features or consideration for decontamination. However, the concrete floors of the chemical storage and water treatment areas will be bermed to contain contents and sealed with a chemical resistant coating. Areas in the water treatment building and external water storage tanks facility will be as follows:

- Water treatment building
- Bermed chemical storage and metering equipment area (with sump for portable pump use)
- Laboratory
- Electrical/control and instrumentation (C&I) room

- Pump room including media filter, softener, demineralizer, and chlorinating equipment (chlorinating equipment will not use gaseous chlorine)
- Raw water storage tank
- Process service water day tank
- Demineralized water storage tank
- Domestic water storage tank

The facility has four storage tanks: raw water, domestic water, demineralized water, and process service water. Backflow prevention requires a reverse pressure backflow assembly at interfaces and air gaps on fill nozzles to the raw and domestic water storage tanks. Process service water or demineralized water will be used to dilute cold chemical feeds, and to wash lines and vessels. The process service water must be free of suspended solids.

The DOE Office of River Protection (ORP) will provide raw water to fill the raw water storage tank. Backflow prevention will be provided in the raw water supply. Raw water is pumped through a media filter to supply the demineralized water and process water systems. The process water system includes a separate feed to the softeners used during boiler makeup. Media filter backwash and softener regeneration wastes are transferred to the non-radioactive liquid waste disposal tank.

Potable water will be used in the WTP for domestic water supply and personal safety equipment. The DOE ORP will provide potable water to fill the domestic water storage tank. Backflow prevention will be provided in the potable water supply. The domestic water system will have the capability to boost chlorine content if required to maintain residual chlorine levels in the domestic water system. Chlorinating equipment will use non-gaseous chlorine to minimize hazards and will be located in the water treatment building. Since no gaseous chlorine will be used, the release of chlorine gas is not possible. Offsite regeneration of demineralizers (or other means suitable for the demineralized water demand) will minimize generation of dangerous waste in the demineralized water system.

These utilities do not present a radiological or chemical hazard and, based on ISM assessments, are not required for the prevention or mitigation of any radiological or chemical hazards associated with the WTP. The raw, potable, process service water, and demineralized water systems are therefore non-ITS.

2.9.4 Cooling Tower Facility

The cooling tower will operate continuously, providing plant cooling water during operation of the process facilities and during shutdown. Figure 2A-9 shows the general arrangement of the cooling tower facility. The plant cooling water systems consist of primary and secondary circuits. The primary circuit is cooled by an open cooling tower with cooling water supplied at a pressure greater than secondary circuit heat exchanger pressures. Secondary, closed-loop circuits are provided for cooling circuits associated with plant process equipment in contact with radioactive material. The secondary cooling circuits are cooled by heat exchange to the primary circuit. Cooling water from the secondary circuit is provided at a pressure greater than the radioactive process pressure but less than the primary circuit pressure.

The cooling tower will be in the southeast quadrant of the site, with adequate clearance from surrounding structures to allow unencumbered airflow. The cooling tower will also be as close as practicable to the water treatment building to simplify the delivery of water treatment chemicals being injected into the plant cooling water.

The cooling tower facility consists of a pump pit and a pumping station that contains the three vertical supply pumps. Each pump is contained in its own bay, which can be isolated and drained with the other two in operation. The entire pumping station will have a removable or self-cleaning screen at its entry to catch foreign materials that enter the cooling tower basin. The foundation of the pumping station will be of reinforced concrete. The top of the pump pits, which require access, will have grating as required.

The cooling tower will be a factory fabricated, field erected, mechanical induced draft unit assembled on a concrete basin. A small enclosure will protect the filtration equipment and the fire protection alarm valve from freezing. The cooling tower includes a concrete cooling tower basin with a concrete pump pit, and water distribution pumps. The tower will be a non-radioactive facility, and as such will not require special design features or consideration for decontamination. All electrical equipment, building steel, and enclosures of electrical apparatus will be grounded in accordance with National Electrical Code, Article 250 (NFPA 70).

The fire protection requirement for the cooling tower facility will conform to NFPA 214, *Standard of Water Cooling Towers*. Where a water sprinkler system is required to be installed in the cooling tower, the supplier will design and install such a system as part of the cooling tower package. Fire extinguishers will be provided as part of the facility in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*.

A sump will discharge system drainage to the NDNR liquid waste disposal system.

The design of the cooling tower facility supports orderly operation and maintenance activities for the plant cooling water system. Adequate water treatment will be used to minimize biological growth, corrosion, and scaling. A commercially available biocide will be used to control biological growth. The deposit control agent/corrosion inhibitor and the biocide chemical addition equipment will be in the water treatment building. Acid addition equipment will be close to the cooling tower. Cooling tower blowdown will be routed to the NDNR liquid waste disposal tank for disposal at the treated effluent disposal facility (TEDF) and will meet TEDF acceptance criteria.

Raw water is supplied directly to the cooling tower basin for makeup. The makeup nozzle will have an approved air gap to prevent backflow.

This utility does not present a radiological hazard or chemical interaction hazards. Chemical hazards are limited to contact exposure and are adequately addressed by standard industrial practices for chemical handling. Based on ISM assessments, cooling water is not required for the prevention or mitigation of any radiological or chemical hazards associated with the WTP. Future cooling water requirements to support ITS functions will be met by dedicated cooling systems in the process facilities that are independent from the BOF cooling water system. The cooling water system is therefore non-ITS.

2.9.5 Fire Water Pump House and Water Storage Tanks

Two fire water pump houses will provide fire water via an underground fire water loop to WTP buildings and hydrants. Section 2.9.10.11, Fire Protection, discusses the underground piping, hydrants, and fire sprinkler systems in the other BOF buildings. Each pump house will contain an Underwriters

Laboratories listed or Factory Mutual (FM) approved diesel driven fire water pump, a motor driven jockey pump, and components necessary for their operation, testing, and maintenance.

Two aboveground fire water storage tanks next to the pump houses will supply water to the suction of the fire water pumps. Raw water supplied by DOE will fill the fire water storage tanks. An air gap at the tank inlet will prevent backflow from the tank to the raw water supply system.

The fire water pump houses will include all necessary lighting, heating, ventilation, and fire protection suitable for all weather protection. General Information volume, section 2.7 further discusses WTP fire protection.

Based on ISM assessments, fire suppression water in the facility buildings is not required to provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the workers and the public due to a radiological or chemical hazard. The fire water system is therefore non-ITS.

2.9.6 Non-Dangerous, Non-Radioactive Liquid Effluent Facility

The NDNR liquid effluent facility and system will consist of the following main components: pump house, collection tank, redundant discharge pumps, discharge monitoring instrumentation (radioactivity, pH, conductivity, flow rate), and discharge header. Flow can be diverted to the TEDF interface flange, or returned to the plant wash vessel in the PT facility. The liquid effluent monitoring instrumentation and redundant discharge pumps will be in a pump house.

The NDNR effluents will originate from various sources. Most will be generated from these BOF sources:

- Water softener regenerant or demineralized water regeneration waste
- Steam boiler blowdown
- Media filter backwash
- Cooling tower blowdown
- Cooling water filter backwash
- Miscellaneous sources

Once the NDNR effluents are collected, they will be transferred to the TEDF. The non-radioactive effluents will be discharged to TEDF based on the accumulated liquid level in the collection tank. The tank will be sized to allow for lag storage capability in case the TEDF is temporarily unavailable to receive waste discharges. For acceptance of this liquid effluent, the DOE ORP requires monitoring of flow, pH, radioactivity, and conductivity of the discharge stream; sampling for characteristic waste constituents every 2 months; and sampling of full waste constituents every 6 months.

If radioactivity is detected in the NDNR effluent, then discharge to the TEDF will be automatically terminated. The tank contents will be manually sampled. The spectacle blind and isolation valve will be reoriented to allow transfer to the plant wash vessel, and the contaminated water will be transferred to the plant wash vessel (V15009) in the PT facility.

The WTP NDNR liquid effluent facility pump house will be a prefabricated structure anchored to a concrete pad with a retention curb sized to contain spillage encloses the pumps. Figures 2A-10 and 2A-11 show the general arrangement of the NDNR liquid waste disposal system and its process piping system.

This utility does not present a radiological or chemical hazard and, based on ISM assessments, is not required for the prevention or mitigation of any radiological or chemical hazards associated with the WTP. The NDNR liquid waste disposal system is therefore non-ITS.

2.9.7 Access Control Facility

The access control facility will monitor industrial traffic entering and exiting the WTP process areas.

This facility does not present a radiological or chemical hazard and, based on ISM assessments, is not required for the prevention or mitigation of any radiological or chemical hazards associated with the WTP. The access control facility is for property protection only and is therefore non-ITS.

2.9.8 Simulator Facility

The simulator facility will provide a location, equipment, and resources to train operations personnel. It will simulate the main control room, the LAW facility control room, and the HLW facility control room. The building will be pre-engineered. Part of the building will be dedicated to simulator systems, and part to training support areas.

Current design places the simulator off the WTP site at the Hanford Site.

This facility does not present a radiological or chemical hazard and, based on ISM assessments, is not required for the prevention or mitigation of any radiological or chemical hazards associated with the WTP. The simulator facility is therefore, non-ITS.

2.9.9 Warehouse

A construction field warehouse will be built and may be used as a permanent warehouse. The warehouse building will be designed and constructed to accommodate receipt, control, and storage requirements for ITS materials, in 24590-WTP-3DP-G04T-00905, *Determination of Quality Level*s. It will also have office space to allow for receipt inspection, document storage, and equipment processing. Construction of the warehouse has been authorized in the scope of the Limited Construction Authorization Agreement.

2.9.10 Auxiliary Systems

This section discusses additional systems or portions of the BOF that have not been previously discussed and which may be useful in creating a conceptual model of the facilities as they pertain to hazard and accident analyses.

2.9.10.1 Lightning Protection

See General Information volume, section 2.8.7, Grounding, Lightning, and Surge Protection.

Lightning protection does not present a radiological or chemical hazard and, based on ISM assessments, is not required for the prevention or mitigation of any radiological or chemical hazards associated with the WTP. The lightning protection system is therefore non-ITS.

2.9.10.2 208/120 VAC Electrical Power

This system provides standard electric service used to operate portable electric tools or office-type electrical devices. Outlets are provided throughout the WTP site through a distribution system.

The 208/120 VAC electrical power system does not present a radiological or chemical hazard. Based on ISM assessments, this system is not required for the prevention or mitigation of any radiological or chemical hazards associated with the WTP. The 208/120 VAC electrical power system is therefore non-ITS.

2.9.10.3 Outdoor Lighting

Outdoor lighting will be provided for roadways, parking lots, walkways, or any other site areas for pedestrian access.

The outdoor lighting uses a high-mast lighting system consisting of 100-foot-high steel poles with high pressure sodium (HPS) lamps, and a pole lighting system consisting of 40-foot-high poles with HPS lamp(s). The masts and poles are arranged to light the site in accordance with IESNA Lighting Handbook requirements. The high-mast poles have a lamp-lowering device for maintenance, and lamps that are dark-sky compliant to eliminate uplight and concentrate the illumination inside the facilities. The high mast poles can withstand a sustained wind velocity of 85 mph with gusts up to 130 % (111 mph).

The masts and poles are more than 100 feet and 40 feet, respectively, away from aboveground ITS SSCs, to avoid impact if a mast or pole should fall. The outdoor lighting does not present a radiological or chemical hazard and is not required for the prevention or mitigation of any radiological or chemical hazards associated with the facility. If any SSC within 100 feet of a mast or within 40 feet of a pole is determined to be ITS. In the future, the SSC will be verified to be able to withstand an impact from the mast/pole, or the mast/pole will be relocated to maintain the required separation. Therefore, the high-mast lighting is non-ITS.

An Authorization Basis Change Notice has been submitted (24590-WTP-ABCN-ESH-01-030) to request authorization to install the outdoor lighting as an LCAR activity.

2.9.10.4 Heat Tracing and Freeze Protection

See General Information volume, section 2.8.6, Heat Tracing and Freeze Protection.

The heat tracing and freeze protection system does not present a radiological or chemical hazard. Based on ISM assessments, this system is not required for the prevention or mitigation of any radiological or chemical hazards associated with the WTP. The heat tracing and freeze protection system is therefore non-ITS.

2.9.10.5 Cathodic Protection

The corrosion protection system uses an impressed current cathodic protection system to provide corrosion protection for buried metallic piping systems in the area of influence, for both the fire protection system and the potable water system. The buried metallic piping systems include the plant service air, the transfer lines, and metallic fittings. General Information, section 2.8.8, further discusses cathodic protection.

The cathodic protection system does not present a radiological or chemical hazard. Based on ISM assessments, this system is not required for the prevention or mitigation of any radiological or chemical hazards associated with the WTP. The cathodic protection system is therefore non-ITS.

2.9.10.6 Grounding

See General Information volume, section 2.8.7.1, Grounding System.

The grounding system does not present a radiological or chemical hazard. Based on ISM assessments, this system is not required for the prevention or mitigation of any radiological or chemical hazards associated with the WTP. The grounding system is therefore, non-ITS.

2.9.10.7 Communications System

The plant design will accommodate cabling and/or raceway system equipment for telephone, public address, intercom, and radio communications systems. Permanent space will be provided in the WTP warehouse for the telephone exchange equipment, paging equipment, wire terminating frames, radio equipment, and coaxial and fiber-optic transmission equipment. General Information, section 2.9.2, further discusses the communications system.

The communications system does not present a radiological or chemical hazard. Based on ISM assessments, this system is not required for the prevention or mitigation of any radiological or chemical hazards associated with the WTP. The communications system is therefore non-ITS.

Public Address and Communication System

A public address system will be provided to allow communication of verbal announcements throughout the WTP. The system will be designed such that a single-component failure do not result in a loss of communication in any area.

The public address and communication system will be used to facilitate operations, information transfer, plant status, and paging activities. This system is considered to be non-ITS and is not relied upon in any accident mitigation actions. This system includes handheld radios, commercial telephones, and other communication devices used at the plant for on-site communications. Speakers will be located throughout the WTP facility to ensure that all plant workers can hear public address announcements. Power for this system is supplied from non-ITS power sources.

An option for facility-wide only or selective-area announcements will be utilized if operations or management determines that it is all that is required.

The public address system and communications system will be evaluated on a periodic basis to ensure that there are no "dead zones" that do not meet the above requirements.

Emergency Notification System

An emergency notification system will be provided. The system will be designed, installed, and maintained in accordance with NFPA 72. Personnel evacuation, fire, and other personnel safety notifications will be annunciated via the broadcast of a distinctive alarms through dedicated loudspeakers. The emergency notification system will be capable of both visual, tonal, and voice annunciation. Sound levels for alarms, announcements, and alerts will be in accordance with NFPA72.

Take-cover evacuation alarm units will be provided to allow clear audible annunciation of take-cover alarms in the areas around the WTP. The units will be part of the existing Hanford Site emergency notification system and will be provided, operated, and maintained by DOE.

An interface will be provided from the take-cover evacuation alarm system to the emergency notification system to allow communications with WTP personnel during site, take-cover alarm conditions. Details of the interfaces will be developed during detailed design.

Hanford Site Crash Phone System

The crash alarm telephone system consists of dedicated telephones (red) that are activated through a conference bridge. This provides a quick, reliable, and interactive medium for simultaneously disseminating emergency messages, protective actions, and information to key personnel at multiple locations. The system is activated by the Hanford Patrol Operations Center at the direction of the Building Emergency Director or the Incident Command.

The WTP will be integrated into the Hanford Onsite Area 200 crash alarm telephone system. The telephones will be only in the main control room, facility control rooms, standby control room, and the incident command post.

Regular Phone System

A telephone system will provide the primary means for normal internal and external communications throughout the WTP. The location of handsets and the services provided at each point will be determined by safety, operational, and commissioning requirements.

The plant design will accommodate cabling and/or raceway system equipment for telephone, public address, intercom, and radio communications systems. Space will be provided for telephone exchange equipment, paging equipment, wire terminating frames, radio equipment, and coaxial and fiber-optic transmission equipment.

2.9.10.8 Sanitary Sewer

The sanitary sewer system will provide a drain path to remove raw sewage and water from WTP facilities, toilets, showers, and sinks. This system will interconnect through underground lines and drains to a central sewage leach field system. The system design will comply with state regulations on water and air pollution and will be in accordance with WSDOH *Design Standards for Large On-Site Sewage Systems*, and *On-Site Sewage Systems, Requirements,* WAC 246-272. The rate of sanitary sewage flow will be sized on the basis of required construction and permanent plant population.

The sanitary sewer system does not present a radiological or chemical hazard. Based on ISM assessments, this system is not required for the prevention or mitigation of any radiological or chemical hazards associated with the WTP. The sanitary sewer system is therefore non-ITS.

Construction of the sanitary sewer system has been authorized in the scope of the Limited Construction Authorization Agreement.

2.9.10.9 Storm Water Drainage

The stormwater drainage system facilitates drainage of water resulting from rain or flood events. This system provides a path for water to drain away from WTP facilities and SSCs. Major facilities will have roof drains that collect rain water and direct it to the storm water drain system.

The belowground storm drainage system is designed in accordance with DOE-STD-1020, for a 25-year storm event year. Aboveground ditching and roadways in conjunction with the storm system will divert flooding away from site facilities in a higher concentration storm from a PC-2 or PC-3 event.

To accommodate precipitation flooding of the site, the following elements have been incorporated into the storm system and site design. The WTP site rough grading plan generally grades the site to follow the existing drainage slopes. The western third of the site is crowned to help divide the flow and to minimize overall slope around buildings. The buildings' primary floor elevations have been set equal to or above the adjacent roads.

Various areas of the WTP will be designed for stormwater runoff, based on the functional requirements of each facility in accordance with the *Natural Phenomena Hazards for Hanford, South-Central Washington* (WHC 2001).

The stormwater drainage system does not present a radiological or chemical hazard. Based on ISM assessments, this system is not required for the prevention or mitigation of any radiological or chemical hazards associated with the WTP. The stormwater drainage system is therefore non-ITS.

Construction of the stormwater drainage system has been authorized in the scope of the Limited Construction Authorization Agreement.

2.9.10.10 Heating, Ventilation, and Air-Conditioning Systems

Heating, ventilation, and air-conditioning (HVAC) systems will be sized to maintain indoor design conditions within prescribed limits.

ITS Switchgear Building HVAC

The ITS switchgear building is considered to have an ITS function for the HVAC system. This equipment (including UPS batteries in the building) is required to be maintained within an operating temperature envelope. This equipment will generate heat during operation, which must be removed from the ITS facility. To maintain the equipment within the operating range, the HVAC will be considered to be ITS and Safety Design Significant. The ITS switchgear facility HVAC system will have technical safety requirement controls associated with its operation.

Since the ITS switchgear building will not be occupied at all times, remote monitoring equipment will be provided for the operators in the control rooms to remotely monitor the temperature inside the building.

The remote monitoring capability will allow operators in the main control rooms to monitor the temperature inside the building and to be alerted if the temperature begins to change dramatically (indicating a possible HVAC failure).

2.9.10.11 Fire Protection

For BOF structures, an industrial fire protection approach will be applied based on considerations of life safety and property protection, and DOE-STD-1066 and DOE G 420.1/440.1G for automatic sprinkler protection.

- Basic construction type and fire resistance will be based on the *Uniform Building Code* (UBC).
- Fire detection systems will be provided in accordance with UBC.
- The fire detection and alarm systems will be designed in accordance with NFPA 72.
- Automatic wetpipe sprinkler system will be provided in accordance with UBC, FM data sheets, and DOE-STD-1066 requirements. The automatic wetpipe sprinkler system will be designed in accordance with NFPA 13 and FM data sheets 2-8N and 3-26.
- Fire detection and fire extinguishing system status and operation signals will be relayed to the main control room. A coded fire alarm signal will be transmitted via radio fire alarm reporting to the Hanford Fire Department upon detection of a fire in the facility.
- Portable fire extinguishers will be provided for these buildings.
- Where required, a method of freeze protection will be used to prevent the fire protection piping from freezing during cold weather.

The fire protection fire water is distributed throughout the WTP facility through a normally pressurized buried piping distribution system. This is not an ITS system.

2.9.11 Glass Former Storage Facility

The purpose of the Glass Former Storage Facility (GFSF), located to the south of the Low-activity Waste (LAW) and High Level Waste (HLW) Vitrification facilities, is to make up unique batches of glass formers for the melter feed systems. The GFSF makes up the batches and transfers the glass former batches to the respective vitrification facility. Once received at the LAW and HLW facilities, the glass formers are mixed with the radioactive waste. Different "recipes" are required to form HLW and LAW glass. Minor variations to the glass former mix may be made dependent on the waste feed variation.

The GFSF consists of an enclosed building, a truck unloading area, and a concrete pad where the majority of the bulk solids handling equipment is located. The GFSF houses storage silos to provide interim storage for the individual glass formers, weigh hoppers and blending silos for weighing out and blending the batches and pneumatic conveying equipment for transporting the batches. The enclosed area consists of an operator control area, bulk unloading equipment, and bag storage area. Outside of the building, a concrete pad provides the foundation for storage silos, weigh hoppers, and pneumatic conveying equipment where the glass formers are blended and transported to the two process facilities. Glass former transfer lines are provided to the HLW and LAW facilities.

Utilities such as electrical power (low and medium voltages) will be provided to the facility. The GFSF is equipped with heaters, filters, and compressors for providing its own dry process air system. A forklift is provided for unloading packaged glass formers.

The GFSF will have the following functional areas:

- Truck unloading area
- Bulk bag storage area
- Storage and blending silos, including weighing hoppers
- Dry process air system including compressors
- Process control area

2.10 References

Project Documents

24590-WTP-3DP-G04T-00905, *Determination of Quality Level.*

24590-WTP-ABCN-ESH-01-030, *Add Rebar Pre-Assembly to LCAR and Add High Mast Lighting.*

24590-WTP-DB-ENG-01-001, *Basis of Design.*

24590-WTP-PSAR-ESH-01-002-01, *Preliminary Safety Analysis Report to Support Construction Authorization, General Information.*

24590-WTP-SRD-ESH-01-002-02, *Safety Requirements Document.*

Codes and Standards

ACI 318. *Building Code Requirements for Structural Concrete,* American Concrete Institute, Farmington Hills, Michigan.

ACI 349. *Code Requirements for Nuclear Safety-Related Concrete Structures*, American Concrete Institute, Farmington Hills, Michigan.

AISC M016. *Manual for Steel Construction - Allowable Stress Design,* 9th Edition. American Institute of Steel Construction, Inc., Chicago, Illinois.

ANSI/AISC N690. *Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities.* American National Standards Institute, New York, New York.

ASCE 4. *Seismic Analysis of Safety-Related Nuclear Structures.* American Society of Civil Engineers, New York, New York.

ASCE 7. *Minimum Design Loads for Buildings and Other Structures.* American Society of Civil Engineers, New York, New York.

DOE-STD-1020. *Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities.* US Department of Energy, Washington, DC.

DOE-STD-1066-97. *Fire Protection Design Criteria.* US Department of Energy, Washington, DC.

IESNA. *Lighting Handbook.* Illuminating Engineers Society of North America, New York, New York.

NFPA 10. *Standards for Portable Fire Extinguishers.* National Fire Protection Association, Quincy, Massachusetts.

NFPA 13. *Standard for the Installation of Sprinkler Systems.* National Fire Protection Association, Quincy, Massachusetts.

NFPA 70. *National Electrical Code.* National Fire Protection Association, Quincy, Massachusetts.

NFPA 72. *National Fire Alarm Code.* National Fire Protection Association, Quincy, Massachusetts.

NFPA 214. *Standards of Water Cooling Tower.* National Fire Protection Association, Quincy, Massachusetts.

UBC. *Uniform Building Code.* International Conference of Building Officials, Whittier, California.

WAC 246-272. Chapters 246 - 272, "On-Site Sewage Systems." *Washington Administrative Code.* Olympia, Washington.

WSDOH-93. *Design Standards for Large On-Site Sewage Systems.* Washington State Department of Health, Olympia, Washington.

Other Documents

DOE. 2001. *Limited Construction Authorization Agreement Between the US Department of Energy, Office of River Protection and Bechtel National, Inc,* 01-OSR-0509, Revision 1-A. US Department of Energy/Office of River Protection, Richland, Washington.

WHC. 2001. *Natural Phenomena Hazards for Hanford Site, South-Central Washington*, HNF-SD-GN-ER-501, Revision 1. Westinghouse Hanford Company, Richland, Washington.

3 Hazard and Accident Analyses

Contents

Tables

3 Hazard and Accident Analyses

3.1 Introduction

This chapter presents detailed balance of facilities (BOF) hazard characterization information, and the BOF hazard and accident analyses results. Chapter 3 of the General Information volume (*Preliminary Safety Analysis Report to Support Partial Construction Authorization; General Information,* 24590-WTP-PSAR-ESH-01-001-01) describes the hazard and accident analyses methodology. The hazard and accident analyses contained in this chapter evaluate the preliminary design and operation of the BOF facility as described in Chapter 2 of this volume.

The results of the hazard and accident analyses will be used to identify the important to safety (ITS) structures, systems, and components (SSCs) as well as the technical safety requirements (TSRs) to protect the health and safety of the BOF facility workers, co-located workers, and the public. The ITS SSCs include those SSCs required to prevent uncontrolled releases of radioactive and hazardous materials that exceed the exposure standards in *Safety Requirements Document* (SRD) (24590-WTP-SRD-ESH-01-001-02). Protecting the ITS SSCs and adhering to the TSRs related to them provides reasonable assurance that the facility will meet the radiological, nuclear, and process safety requirements in the SRD and in applicable regulations.

3.2 Requirements

The principal requirements applicable to the BOF hazard and accident analyses are in section 3.2 of *Preliminary Safety Analysis Report to Support Partial Construction Authorization; General Information* (24590-WTP-PSAR-ESH-01-001-01).

3.3 Hazard Analysis

The River Protection Project - Waste Treatment Plant (WTP) project has a defined process for hazard analysis, the integrated safety management (ISM) process. This process is consistent with the implementing standard in Appendix A of the SRD for identifying radiological, nuclear, and process safety requirements and standards. Chapter 3 of the General Information volume describes the ISM process.

3.3.1 Hazard Identification

The general methodology for hazard identification is described in Chapter 3 of the General Information volume. The hazard analysis for the buildings and systems within BOF was based on design material (for example, system descriptions, process flow diagrams, and general layout drawings). The hazard analysis used the preliminary hazards analysis (PHA) technique, also referred to as a HAZOP-1. The PHA was augmented with guide-words, as described in *Guide: Integrated Safety Management* (24590-WTP-GPG-SANA-002).

The Standards Identification Process Database (SIPD) documents the application of the hazards analysis in accordance with 24590-WTP-GPG-SANA-002 during the BOF safety analysis. The following sections discuss these results.

3.3.2 Hazard Identification Results

Chapter 2 describes the balance of facilities. The following subsections summarize the results of the hazard identification for the BOF based on those descriptions.

3.3.2.1 Hazardous and Radioactive Materials

3.3.2.1.1 Radioactive Materials

The BOF is a set of auxiliary facilities and systems that do not process radioactive materials but rather provide support to the process facilities. None of the buildings or systems addressed in this submittal contain radioactive material. Later preliminary safety analysis report (PSAR) submittals will address BOF facilities and systems that contain radioactive material such as the waste buildings.

3.3.2.1.2 Process and By-Product Chemicals

This section identifies the major chemicals in the building and systems described in Chapter 2. The hazard identification and evaluation results for each BOF building or system is further discussed in section 3.3.3.

- Table 3-1 lists the volumes and use rates of the chemicals in the water treatment facility
- Table 3-2 lists the possible interactions between chemicals used at the water treatment facility
- Table 3-3 lists the volumes and use rates of the chemicals in the cooling tower facility
- <u>Table 3-7 lists the chemicals and typical design capacity in the glass former storage facility</u>
- <u>Table 3-8 lists the possible interaction between chemicals in the glass former storage facility</u>

The primary information for these table came from a survey of chemical safety data, including material safety data sheets.

3.3.2.1.3 Preliminary Hazard Categorization

None of the facilities or systems addressed by this report contain any radiological or extremely hazardous chemicals therefore hazard categorization is not applicable at this stage.

The waste buildings and wet chemical storage facility will be categorized in accordance with *Hazard Categorization, and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports* (DOE-STD-1027-92) as part of a later PSAR submittal.

3.3.2.2 Energy Sources

This section identifies the major energy sources. The hazard identification and evaluation results for each BOF building or system are further discussed in section 3.3.3.

- Table 3-4 identifies the energy sources for the BOF

3.3.3 Hazard Evaluation Results

The hazards evaluated for the BOF show that there are no radiological hazards present because there will be no radioactive inventories located in the evaluated facilities. The chemical hazards identified were found to be hazards consistent with normal chemical industrial facilities. Chemical interactions have been evaluated and found to not impact the safe operation of the facilities as long as standard handling methods are used. Based on this, most of the BOF SSCs are not important to safety (ITS). These non-ITS SSCs do not require additional analysis because their failure will not result in any adverse impact to the process facilities. BOF systems were not independently analyzed unless they contained radioactive materials or chemicals, or unless they had been determined to be ITS by the process facilities.

Since BOF systems support other WTP facilities, an ISM review of other WTP facilities was done to determine what BOF systems, if any, would be required to support safety design class (SDC) and safety design significant (SDS) functions in those facilities. The ITS switchgear building was found to be important to safety because of its function to support accident mitigation in the high level waste (HLW) and pretreatment (PT) process facilities. The ITS switchgear building was analyzed to determine what initiators could impact the building's components and the components' safety functions. The majority of the natural phenomena hazards were found to be initiators. Based on this, control strategies were identified. During the ISM analysis the ITS switchgear building was also found to contain hazards (hydrogen generation and sulfuric acid in batteries) that could impact the building and its ability to perform its safety functions. Control strategies were identified to prevent or mitigate these hazards.

In addition, Risk Reduction Class (RRC) systems identified during ISM of other WTP facilities were further analyzed to determine what BOF systems would be required to support these RRC functions. The majority of the identified RRC systems required no BOF support since the systems are totally contained within the parent facility. An example would be the ventilation systems C2 and C3 interlock to C5, which has no connection or requirement to BOF. The resulting BOF RRC systems from this analysis have been tabulated in Table 3-5.

Based on hazard analysis results, none of the BOF SSCs (with the exception of the ITS switchgear) are required to be operable during or after a design basis natural phenomena hazard (NPH) event. These facilities (with the exception of the ITS switchgear) have therefore been seismically classified in accordance with the uniform building code methodology for classification of essential and non-essential facilities. The results are shown in Table 3-6. The buildings categorized as SC-IV do not have essential functions required following the design basis NPH events. The firewater pump house has been categorized as SC-III, to be consistent with commercial practices for pump houses. The ITS switchgear is required to be operable during or after a design basis NPH event in order to support the process facilities. The ITS switchgear, building foundation, battery racks, and associated supports have been categorized as SC-I. The ITS switchgear building structure, HVAC, and electrical ductbank, which runs from the ITS switchgear building to the process facilities, have been categorized as SC-II.

The following subsections describe in more detail the hazard evaluation results for the BOF based on the facility and system descriptions in Chapter 2. Appendix A is a print out of the Standards Identification Process Database (SIPD) for the BOF.

3.3.3.1 Administration Building

The administration building is an office building supporting the daily engineering, operations management, and administrative activities of the WTP. The administration building houses the offices of the administrative staff and necessary support equipment with which to carry out their duties.

There are no radioactive materials or process chemicals stored, handled, or processed in or near the administration building. Major hazards associated with the administration building include fire hazards associated with the combustible loading in the structure, electrical equipment that could serve as initiators to fire and present electrical shock hazards, and repetitive motion hazards. The building will be designed to meet current health, safety, fire, and electrical codes that will greatly reduce the potential for fires and electrical shock. Additionally, the fire separation distance between the administration building and adjacent facilities will be sufficient to preclude the possibility of a fire spreading to adjacent structures.

The hazards identified in the administration building are addressed by *Washington State Life/Safety Codes*, OSHA regulations, and WTP safety procedures. These hazards cannot initiate chemical or radiological releases. Major energy sources in the administration building are those associated with electrical sources, the heating, ventilation and air conditioning (HVAC) system, office equipment, and miscellaneous support and communications equipment (see Table 3-4).

Conclusion:

- There are no radiological or chemical hazards associated with the administration building.
- Controls are not required to meet Safety Criterion 2.0-1 and 2.0-2.
- Identified hazards have no potential to affect the performance of any safety design class (SDC) or SDS SSCs in other facilities.
- No SSCs have been credited with prevention or mitigation of an accident in another facility.
- Therefore, no SSCs have been identified as ITS.

3.3.3.2 Chiller/Compressor Plant

The chiller/compressor plant will house major equipment for supplying compressed air and chilled water to the WTP activities.

There will be no radiological processes performed within the chiller/compressor plant. However, there will be specific operations performed at the chiller/compressor plant, which will support WTP. The operations are:

- Provide compressed air
- Provide chilled water

Major energy sources contained in the chiller/compressor plant will consist of electrical power and compressed air. The major hazards associated with the chiller/compressor plant include pressurized air, electrical equipment that could serve as fire initiators, and electrical shock hazards. The building will be designed to meet current health, safety, fire, and electrical codes that will greatly reduce the potential for fires and electrical shock. The building will contain no radiological hazards or hazardous materials.

Conclusion:

- There are no radiological or chemical hazards associated with the chiller/compressor plant.
- Controls are not required to meet Safety Criterion 2.0-1 and 2.0-2.
- Identified hazards have no potential to affect the performance of any SDC or SDS SSCs in other facilities.
- No SSCs have been credited with prevention or mitigation of an accident in another facility.
- Therefore, no SSCs have been identified as ITS.

3.3.3.3 Site Electrical Services

Each of the following subsections will address the major components or systems within the site electrical services. The conclusion that follows applies to all three subsections.

13.8 kV Supply System

The 13.8 kV power to the site will be provided via the Department of Energy (DOE) site substation. The DOE site substation will consist of two 13.8 kV power transformers supplied from two separate offsite 230 kV power lines.

The major hazards in the 13.8 kV supply system is high voltage that could lead to electrical shock or initiating a fire of combustible materials. No radioactive or hazardous chemicals have been identified. This facility will contain no ITS SSCs.

Switchgear Building

The switchgear building will contain the13.8 kV switchgear. The switchgear will be located in free-standing vertical cabinets in the main electrical room.

The major hazard in the switchgear building is high voltage that could lead to electrical shock or initiating a fire of combustible materials. No radioactive or hazardous chemicals will be stored, used, or contained in the switchgear building.

BOF Switchgear Building

The BOF switchgear building will support normal power supply (not important to safety) to the BOF facilities in the plant. The building will house four 4.16 kV switchgears and four 480 V unit substations.

The major hazard in the BOF switchgear building is high voltage that could lead to electrical shock or initiating a fire of combustible materials. No radioactive or hazardous chemicals will be stored, used, or contained in the switchgear building.

Conclusion:

- There are no radiological or chemical hazards associated with Site Electrical Services.
- Controls are not required to meet Safety Criterion 2.0-1 and 2.0-2.

- Identified hazards have no potential to affect the performance of any SDC or SDS SSCs in other facilities.
- No SSCs have been credited with prevention or mitigation of an accident in another facility.
- Therefore, no SSCs have been identified as ITS.

3.3.3.4 ITS Switchgear Building

The ITS switchgear building is adjacent to the diesel generators facility. It contains the three trains of ITS switchgear equipment to step-down, distribute, and control ITS emergency power from the emergency diesel generators. Each train is capable of supplying the power needs of the WTP facilities. The hazards present at the ITS switchgear building are similar to those found at any industrial facility. No radioactive materials will be present in the building.

The hazards associated with this facility are:

- Electric shock
- A fire from combustibles in the facilities
- Hydrogen buildup from the uninterruptible power supply (UPS) batteries
- Sulfuric acid contained in the batteries

The ITS switchgear building is a unique BOF facility in that it contains equipment that route the emergency power from the emergency diesel generators to the HLW, PT, and other facilities. The hazards identified above have the potential for affecting the performance of the ITS switchgear building. A complete failure of the ITS switchgear building and all its components would prevent the ability to provide emergency power to the process facilities. The ITS switchgear building, ITS equipment located inside, and the 4.16 kV electrical ductbank are designed and maintained to ensure emergency power will be available to the process facilities to support evaluated design basis events (DBEs). Refer to the facility specific volumes for a discussion of the selected DBEs that require emergency power for achieving safe state condition. The ITS switchgear facility is designed with three distinct trains so that a single active failure will not prevent the ITS switchgear facility from performing its safety functions.

The temperature within the ITS building will be monitored and controlled to ensure that the ITS electrical equipment (switchgear, batteries, etc.) is maintained within their design operating range. One heating and cooling system will be dedicated to each of three physically separated fire areas. Each heating and cooling system will receive ITS emergency power during loss of normal power. Failure of a single heating and cooling system will not disable operation of the ITS switchgear. Air intake will be filtered and monitored to ensure that dust and ashfall are controlled from damaging the ITS equipment.

The uninterruptible power supply (UPS) batteries, located inside a dedicated area within the ITS switchgear building, will be maintained within their operating temperature range to ensure reliability and operability. Hydrogen generation from the batteries will be controlled and removed from the UPS battery rooms by an exhaust system. The exhaust system contains with two 100 % fans that will maintain the hydrogen concentrations below the lower flammability limit (LFL). The secondary fan will automatically start after failure of the primary fan. In addition, curbs will be placed in the battery rooms to contain any sulfuric acid spillage from the batteries.

Fire protection in the ITS switchgear building will consist of sprinkler systems and manual fire extinguishers. The primary initiator for a fire in the ITS switchgear building would be from an electrical source. By adhering to the selected standards in the SRD, the possibility of an electrically induced fire is reduced.

The ITS switchgear facility components are designed to ensure continued operation during and following a seismic event and other NPH conditions. For example, the ITS switchgear foundation, underground 4.16 kV electrical distribution ductbank, and ITS equipment within these structures will be supported to SC-I requirements. In addition, the batteries will be seismically mounted in the battery racks.

The diesel generators will be required to supply emergency power to the process facilities should there be a loss of offsite power to the WTP site. Evaluations are being performed to assess plant responses and diesel load requirements as a result of a loss of offsite power event. This information will be provided at a later submittal.

Conclusion:

- There are no radiological or chemical hazards associated with the ITS switchgear building.
- Controls are not required to meet Safety Criterion 2.0-1 and 2.0-2.
- The ITS switchgear has been credited with prevention or mitigation of an accident in the HLW facility.
- The ITS switchgear building, ITS equipment located inside, and the electrical ductbank are designed and maintained to ensure emergency power will be available to the process facilities to support evaluated DBEs.

3.3.3.5 Water Treatment Building and Storage Tanks

The water treatment building will provide process, domestic, and demineralized water to the PT, low activity waste (LAW), HLW, and BOF facilities (as required). DOE will supply the feed water for the water treatment building. The processes performed at the water treatment building and storage tanks include:

- The distribution of domestic water
- Treatment and distribution of process service water
- Make-up and distribution of demineralized water

The major hazards in the water treatment facility include electrical hazards and chemical hazards. The building will not contain radioactive materials or extremely hazardous chemicals. However, the facility will contain water treatment chemicals (see Table 3-1). These interactions are discussed in more detail below.

Chemical Interactions at the Water Treatment Facility

The water treatment facility contains no radioactive materials or process chemicals needed for the vitrification processes, but does contain water treatment chemicals. Chemical interactions at the water treatment facility could be possible in the event of unplanned mixing of these chemicals. However, as Table 3-2 indicates, the interaction between these chemicals would not lead to a chemical reaction.

The chemicals to be used in the water treatment facility are listed below:

- Sodium hypochlorite (NaOCl) 12 wt %
- Sodium bromide (NaBr) 40 wt %
- Deposit control agent (DCA)

Areas within the water treatment building and external water storage tanks include:

- Water treatment building
  - Bermed and sealed chemical treatment area (with sump)
  - Laboratory
  - Motor control center
  - Pump room
- External water storage tanks
  - Raw water storage tank
  - Process water day tank
  - Demineralized water storage tank
  - Domestic water storage tank

The transfer lines from the facility to the external storage tanks and other onsite facilities may be buried to prevent freezing. Portions of lines exposed to ambient conditions will be freeze protected.

Major energy sources at the water treatment building include electrical sources, rotating mechanical equipment, and instrument air.

Conclusion:

- There are no radiological or chemical hazards beyond those found in normal industrial facilities associated with the water treatment facility.
- Controls are not required to meet Safety Criterion 2.0-1 and 2.0-2.
- Identified hazards have no potential to affect the performance of any SDC or SDS SSCs in other facilities.
- No SSCs have been credited with prevention or mitigation of an accident in another facility.
- Therefore, no SSCs have been identified as ITS.

3.3.3.6 Cooling Tower Facility

The cooling water system is designed to supply plant cooling water through the heat exchangers to equipment coolers and to reject heat to the atmosphere. Cooling water will remove heat from various plant equipment and reject this heat to a multi-cell mechanical draft-cooling tower.

The BOF and process facilities cooling water systems will use one primary and three secondary loops to provide isolation from potential contamination. The primary loop will operate at a higher pressure than the secondary loops in contaminated/confinement areas to prevent migration of potentially contaminated fluids to the primary loop in the event of a leak.

There will be no radioactive materials stored in the cooling tower facility. Water treatment chemicals will be injected into the cooling tower basin from the metering pumps located in the water treatment building. A dedicated sulfuric acid injection system may be used for pH control. The description for the sulfuric acid use is identified in Table 3-3. The acid will be injected into the basin at a location with sufficient separation from where the other water treatment chemicals are injected in order to avoid hazardous interactions.

The major energy sources at the cooling tower facility will be rotating machinery and electrical power sources. The hazard associated with electrical equipment could serve as initiators to fire and present electrical shock hazards. The cooling tower is a wooden structure; therefore, it is equipped with a fire protection system.

Conclusion:

- There are no radiological or chemical hazards associated with Site Electrical Services.
- Controls are not required to meet Safety Criterion 2.0-1 and 2.0-2.
- Identified hazards have no potential to affect the performance of any SDC or SDS SSCs in other facilities.
- No SSCs have been credited with prevention or mitigation of an accident in another facility.
- Therefore, no SSCs have been identified as ITS.

3.3.3.7 Fire Water Pump Houses and Fire Water Storage Facility

The purpose of the fire water pump houses and fire water storage tanks is to supply fire water at sufficient flows and pressures to the WTP facility for fire suppression. The fire water pump house contains two pumps which provide water via a fire water loop to buildings and hydrants on the WTP site. The water storage tanks will supply water to the pumps and subsequently to the fire protection systems throughout the WTP facility.

The water storage tanks are supplied with raw water from DOE via an underground line. The water storage tanks will be insulated and heated to prevent freezing. Each tank will be able to supply water to either of the pump houses. The fire water pump houses and fire water storage tanks will be protected from freezing conditions to prevent loss of protection capability.

The fire water pump houses will be two separate and distinct structures. Each structure will house a skid mounted diesel driven fire pump, a motor driven jockey pump, diesel fuel oil day tank, and associated components necessary for the operation, testing, and maintenance of the fire water supply system. The diesel fuel oil day tank will be installed in a bermed area with a sump. The major hazards in the fire water pump houses include electrical fire, electrical shock, and the presence of diesel fuel.

Conclusion:

- There are no radiological or chemical hazards associated with fire water pump houses and fire water storage tanks.

- Controls are not required to meet Safety Criterion 2.0-1 and 2.0-2.
- Identified hazards have no potential to affect the performance of any SDC or SDS SSCs in other facilities.
- No SSCs have been credited with prevention or mitigation of an accident in another facility.
- Therefore, no SSCs have been identified as ITS.

3.3.3.8 Non-Dangerous Non-Radioactive Liquid Waste Disposal Facility

The non-dangerous non-radioactive (NDNR) liquid waste disposal facility consists of the following main components:

- Collection tank
- Discharge pumps
- Discharge monitoring instrumentation (radioactivity, pH, conductivity, flow rate)
- Discharge header
- Control valve
- Connection to the Treated Effluent Disposal Facility (TEDF) interface flange
- Recycle piping connection to plant wash vessel in pretreatment facility via a spectacle blind

The NDNR liquid waste disposal facility is the central collection point for various NDNR liquid wastes at WTP. The NDNR effluents originate from various sources in the plant. The majority of effluents are generated from the sources as identified below:

- Water softener regenerant from the water treatment plant
- Steam boiler blowdown from the steam plant
- Media filter backwash from the water treatment plant
- Cooling water blowdown from the cooling towers
- Cooling water filter backwash from the cooling towers

In the unlikely event that contaminated effluent is pumped erroneously to the NDNR effluent tank, it will be isolated, tested, and evaluated to determine processing requirements. If it is determined that the contents of the tank cannot be sent to TEDF, then the contents of the tank will be returned to the pretreatment facility for processing via a return line. Since the NDNR liquid waste disposal facility will not store, handle, or process radioactive materials nor process chemicals, the hazards associated with the NDNR liquid waste disposal facility can be characterized as standard industrial hazards.

Major hazards include electrical energy sources. The NDNR liquid waste disposal facility will be sufficiently remote to adjacent WTP facilities to preclude interaction during postulated upset conditions.

Conclusion:

- There are no radiological or chemical hazards associated with the NDNR liquid waste disposal facility.
- Controls are not required to meet Safety Criterion 2.0-1 and 2.0-2.

- Identified hazards have no potential to affect the performance of any SDC or SDS SSCs in other facilities.
- No SSCs have been credited with prevention or mitigation of an accident in another facility.
- Therefore, no SSCs have been identified as ITS.

3.3.3.9 Access Control Facility

The access control facility (guard house) is designed to house personnel to control the gate and monitor industrial traffic entering and exiting the WTP process areas. The building houses guard and equipment including a computer, telephone, and a desk.

Conclusion:

- There are no radiological or chemical hazards associated with the access control facility.
- Controls are not required to meet Safety Criterion 2.0-1 and 2.0-2.
- Identified hazards have no potential to affect the performance of any SDC or SDS SSCs in other facilities.
- No SSCs have been credited with prevention or mitigation of an accident in another facility.
- Therefore, no SSCs have been identified as ITS.

3.3.3.10 Warehouse

The warehouse will be used to receive, store, and distribute equipment and supplies to support construction and eventually operation of WTP. The warehouse will perform similar functions as other industrial type warehouses. No radioactive materials will be received or stored within the warehouse area. ITS equipment may be stored in the warehouse until installed in the plant. Requirements for storage of the ITS equipment will be met when required.

Industrial chemicals may be stored in small quantities in approved storage lockers in the warehouse and distributed as needed. These chemicals will meet the requirements of OSHA for the storage of industrial chemicals.

The hazards identified in the warehouse are addressed by *Washington State Life/Safety Codes*, OSHA regulations, and WTP safety procedures and cannot initiate chemical or radiological releases.

Conclusion:

- There are no radiological or chemical hazards associated with the warehouse.
- Controls are not required to meet Safety Criterion 2.0-1 and 2.0-2.
- Identified hazards have no potential to affect the performance of any SDC or SDS SSCs in other facilities.
- No SSCs have been credited with prevention or mitigation of an accident in another facility.
- Therefore, no SSCs have been identified as ITS.

3.3.3.11 Glass Former Storage Facility

The Glass Former Storage Facility (GFSF) stores and blends the glass formers, then transports the batches to the melter feed systems in the LAW and HLW vitrification buildings. The following operations are performed at the facility:

- Bulk dry materials are received and offloaded to storage silos.
- Individual glass formers are weighed and blended.
- Blended batches are transferred to the appropriate feed hopper in the LAW or HLW vitrification buildings.

The blending and transfer process is as follows:

- Glass formers are transferred from the storage silos into weigh hoppers.
- After weighing, the glass formers are gravity fed to the transporters.
- Glass formers are pneumatically transferred to the blending silo.
- The blending silo contents are blended.
- After blending, the blended glass former batch is gravity fed to the transporter.
- The glass former batch is transported to the appropriate feed hopper.

The dry materials stored in the glass former storage facility are: silica, zinc oxide, ferric oxide, zircon sand, lithium carbonate, sodium carbonate, boric acid, aluminum silicate, titanium oxide, magnesium silicate, calcium silicate, borax, and sucrose.

No radioactive materials will be present in the GFSF. The material hazards present at the GFSF are from the glass formers. 24590-WTP-RPT-ESH-01-001 (Determination of Extremely Hazardous Substances) evaluated the hazardous chemicals at the Waste Treatment Plant. The evaluation determined that the material in the GFSF were considered not to be extremely hazardous substances. RPT-W375-SA00001 (Waste Treatment Plant Explosive Hazards Evaluation) evaluated sugar dust explosions at the Waste Treatment Plant, and concluded that sugar dust explosions were theoretically possible outside the LAW and HLW facilities, however the maximum calculated pressure is limited to 109 psig. The sucrose hopper is not pressure rated and would rupture at low pressure. In the very unlikely event of a sugar dust explosion, the closest facilities in a 180 degree arc from East to South to West are all non-ITS, protected by the physical barrier of the other hoppers and distance, 50+ feet. The LAW Vitrification Facility is protected by both distance, 200 feet, and robust construction, 2 to 3 ft. thick reinforced concrete. (LAW Vitrification Building General Arrangement Plan at El. 3;-0' to El. 68;-0", 24590-LAW-P1-P01T-00002 to 24590-LAW-P1-P01T-00006). At most, minimal damage would be expected to adjacent facilities. Any potential explosion would not involve radioactive material. Standard commercial practices are used to control this hazard. The other material hazards present at this facility are similar to those found at many industrial facilities.

While the chemical interaction matrix does indicate the potential for heat generation and pressurization for combinations of certain chemicals, no adverse effects are expected based on the following:

- The physical form of the materials, as a powder, limits the surface area which can be in contact. The reactions would be surface reactions and are therefore limited.

- Principal reaction would be an acid + carbonate reaction which generates carbon dioxide and some heat. The blending silos are well ventilated by design since they receive/discharge large volumes of bulk material, and are vented under all operating conditions.
- The majority of each glass former mixture is inert to these reactions; such as silicates or oxides. These inert materials would adsorb heat and limit any temperature increase.
- Many of the reactions occur, or would increase, under moist conditions and the GFF materials are kept dry to facilitate material flow.
- For an example, reaction of boric acid and sucrose is not anticipated to be of concern since dilute solutions are made, stored, and used as insecticide without degradation.

Chemical exposure during normal operations will be controlled to recognized standards through full regulatory conforming design and operating procedures. A chemical hygiene plan will address how to deal with spills and other off-normal incidents. Both the operating procedures and chemical hygiene plan will be prepared in the future to support operations.

Conclusion:

- There are no radiological or material hazards above threshold values associated with the GFF.
- Controls are not required to meet Safety Criterion 2.0-1 and 2.0-2.
- Identified hazards have no potential to affect the performance of any SDC or SDS SSCs in other facilities.
- No SSCs have been credited with prevention or mitigation of an accident in another facility.

Therefore, no SSCs have been identified as ITS.

3.3.4 Common Mode and Common Cause Failures

Failures in the BOF services have the potential to become common cause initiators for accidents in the process facilities because the BOF services support the process buildings and safety functions. For example, the ITS switchgear building supports the process facilities by providing emergency electric power from the emergency diesel generators. Should a failure occur in the ITS switchgear building that prevents its operation, it would create a common cause operability condition in the process facilities.

3.3.5 Design Basis Event Selection

The results of the design basis event (DBE) selection process, as applied to the ISM results for each facility are described in the facility-specific PSAR volumes. A table of the selected DBEs for each facility is included in the facility-specific volumes, grouped according to accident type. It includes a listing of the hazardous situations represented by the DBEs.

3.4 Accident Analysis

3.4.1 Internal Design Basis Event

There are no radiological materials or extremely dangerous chemicals within the facilities or systems in this submittal therefore there is no detailed evaluation required of internal design basis events.

3.4.2 External Events

There are no radiological materials or extremely dangerous chemicals within the facilities or systems in this submittal therefore there is no detailed evaluation required of external events.

3.5 Seismic Probabilistic Risk Assessment

There are no radiological materials within the facilities or systems in this submittal; therefore, a detailed Seismic PRA is not required.

3.6 Adherence to Risk Goals and Results

3.6.1 Risk Goals Methodology

The WTP is required to demonstrate conformance to facility level risk goals. The WTP facility level risk goals to which the calculated WTP risks will be compared are defined in one form or another by the following documents:

- *Top-Level Radiological, Nuclear, and Process Safety Standards and Principles for TWRS Privatization Contractors*, DOE/RL-96-0006
- *Regulatory Unit Position on Conformance with Risk Goals in DOE/RL-96-0006*, RL/REG-2000-08
- *Regulatory Unit Position on the Achievement of Adequate Safety*, RL/REG-2000-15

The Operations Risk Assessment (RA) as described in Appendix E of the *Design Guide for Integrated Safety Management* (24590-WTP-GPG-SANA-002) is being applied to meet this end. The results obtained from each of the facility analyses will demonstrate that each of the prescribed risk goals is met by the current design or the insights from the results of the analysis support the need for changes to plant design to ensure future compliance. The Operations RA is documented in Calculation No. 24590-WTP-U7C-50-00001, *WTP Risk Analysis - Risk Goal Confirmation.*

The methodology uses SIPD as the primary source of information for radiological hazards and incorporates the contributions to individual risk goals, which are derived from the results of the Seismic Probabilistic Risk Analysis.

3.6.1.1 Phased Preliminary Safety Analysis Report Approach

Each phased PSAR submittal represents the risks to receptor populations from the specific facility's design and known interfaces with other facilities. Because the WTP facilities are inter-connected and a design change in one facility may impact the available risk goal allocation for another facility, the WTP risk goal will be validated with the completion of each facility design.

Should the calculated cumulative individual risk goal contributions to one or more receptor population approach the allowable threshold, conservatism in existing analyses will be removed. If this reduction in conservatism is insufficient to demonstrate conformance to the risk goals, the design of individual facilities will be adjusted or modified as necessary to ensure that the overall WTP risk goal is maintained. If necessary, this will be done as an optimization analysis, in which the options with the highest risk-benefit ratio are considered first.

3.6.2 Results and Conclusion

There are no radiological release events associated with the buildings and systems within this submittal. The release associated with the HLW DBE that credits the ITS switchgear is part of the HLW contribution to risk. Therefore, this BOF submittal does not have any influence on the radiological risk to the facility worker, collocated worker, or general public. Facilities in future BOF PSAR submittals, such as the encapsulation facility and waste buildings, have the potential for a radiological release and their contributions to the plant risk will be quantified and reported.

3.7 References

Project Documents

24590-WTP-GPG-SANA-002, *Design Guide for Integrated Safety Management.*

24590-WTP-PSAR-ESH-01-001-01, *Preliminary Safety Analysis Report to Support Partial Construction Authorization, General Information.*

24590-WTP-RPT-ESH-01-001 *Determination of Extremely Hazardous Substances*

RPT-W375-SA00001 *Waste Treatment Plant Explosive Hazards Evaluation*

24590-LAW-P1-P01T-00002, *LAW Vitrification Building General Arrangement Plan at Elevation 3 ft*

24590-LAW-P1-P01T-00006, *LAW Vitrification Building General Arrangement Plan at Elevation 68 ft*

24590-WTP-SRD-ESH-01-001-02, *Safety Requirements Document (SRD)*

24590-WTP-U7C-50-00001, *WTP Risk Analysis - Risk Goal Confirmation.*

Codes and Standards

DOE-RL 2000a. *Regulatory Unit Position on Conformance with Risk Goals in DOE/RL-96-0006,* RL/REG-2000-08, US Department of Energy, Office of River Protection, Richland, Washington.

DOE-RL 2000b. *Regulatory Unit Position on the Achievement of Adequate Safety,* RL/REG-2000-15, US Department of Energy, Office of River Protection, Richland, Washington.

DOE-RL 2000c. *Top-Level Radiological, Nuclear, and Process Safety Standards and Principles for TWRS Privatization Contractors*, DOE/RL-96-0006, US Department of Energy, Office of River Protection, Richland, Washington.

DOE-STD-1027. "Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23," *Nuclear Safety Analysis Reports*, US Department of Energy, Washington, DC.

Table 3-1 Chemicals in the Water Treatment Facility

Material	Location (Within Water Treatment Facility)	Typical Volumes Stored (30 day storage)	Use Rates (gallon/day)
Sodium hypochlorite 12 wt %	tank	800 gal	23-34 gpd
Sodium bromide 40 wt %	tank	300 gal	7-11 gpd
Deposit Control Agent (DCA)	tank	550 gal	17-23 gpd

Table 3-2 Matrix of Possible Interactions of the Chemicals in the Water Treatment Facility

Chemicals	**Sodium Hypochlorite 12 wt %**	**Sodium Bromide 40 wt %**	**Deposit Control Agents**
Sodium hypochlorite 12 wt %		No Reaction	No Reaction
Sodium Bromide 40 wt %			No Reaction
Deposit Control Agents (DCA)[a]			

a The exact formulations of deposit control agents (DCAs) are typically proprietary, and formulated for both the system use and raw water chemistry. Typical compounds used to prevent deposits from forming are phosphates and hexa-meta-silicates. Neither of these compounds has any appreciable reaction with either sodium hypochlorite or bromide, and is the basis for the no reaction. Selection of the DCA supplier (and hence formulation) during cold commissioning will be based in part on this no reaction criteria.

Table 3-3 Chemicals in the Cooling Tower Facility

Material	Location (Within Cooling Tower Facility)	Typical Volumes Stored (30 day storage)	Use Rates (gallons/day)
Sulfuric Acid 93 wt %	tank	300 gal	8 gpd

Table 3-4 Energy Sources of the BOF

Energy	Energy Type	Source/Quantity
BOF Switchgear building		
Kinetic	Rotational	Rotational energies associated with heating ventilation and air-conditioning (HVAC)
Thermal	Heat	Heat from HVAC and temperature rise of active electrical components
Thermal	Friction	Friction heat from active components of HVAC
Electrical	Electric shock	Four 4.16 kV switchgears, four 480 V unit substations, auxiliary-lighting, HVAC, convenience power, two 125 V DC systems, two UPS systems
Switchgear building		
Kinetic	Rotational	Rotational energies associated with HVAC
Thermal	Heat	Heat from HVAC and temperature rise of active electrical components
Thermal	Friction	Friction heat from active components of HVAC
Electrical	Electric shock	Seven 13.6 kV switchgears, auxiliary-lighting, HVAC, convenience power, distribution panels, two 125 V DC systems for switchgear control
ITS switchgear building		
Kinetic	Rotational	Rotational energies associated with HVAC
Thermal	Combustion	Hydrogen from battery banks
Thermal	Heat	Heat from HVAC and temperature rise of active electrical components
Thermal	Friction	Friction heat from active components of HVAC
Electrical	Electric shock	Three 4.16 kV switchgears, three 480 V emergency MCC, three 125 V DC system which supports DC panels and uninterrupted power supply (UPS) chargers, auxiliary-lighting, HVAC, convenience power
Administration building		
Kinetic	Rotational	Rotational energies associated with HVAC
Thermal	Heat	Hot water, heating
Thermal	Friction	Friction heat from active components of HVAC
Thermal	Combustion	Office supplies/paper
Electrical	Electric shock	Lighting panels (208 VAC/120VAC), power to HVAC, convenience outlets

Table 3-4 Energy Sources of the BOF

Energy	Energy Type	Source/Quantity
Chiller/compressor plant		
Kinetic	Rotational	Rotational energies associated with compressors, chillers and pumps
Potential energy	Pressure	Chilled water at nominal 65 psig, process air at nominal 160 psig, instrument air at nominal 100 psig
Thermal	Heat	Friction heat from compressors, chillers, pumps; heat from air compression.
Electrical	Electric shock, electric heat	Four 13.8 kV motors (air compressors), 4160V motors (chillers), 480 V motors and associated MCC, auxiliary - lighting, HVAC, convenience power
Water treatment building		
Kinetic	Rotational	Rotational energies associated with pumps
Potential energy	Pressure	Domestic water at nominal 75 psig
Thermal	Heat	Heat from HVAC
Thermal	Friction	Friction heat from pumps and fans
Electrical	Electric shock, electric heat	Three 480 V pumps and MCC (domestic water), auxiliary- lighting, HVAC, convenience power
Cooling tower		
Kinetic	Rotational	Rotational energies from fans and pumps
Potential energy	Pressure	Cooling water pressurized up to 65 psig
Thermal	Friction	Friction heat from pumps and fans
Thermal	Combustion	Wood in cooling tower
Electrical	Electric shock, electric heat	Three 4160 V motors (cooling water pumps), three 480 V motor and MCC (fans), auxiliary- lighting, HVAC, convenience power
Fire water pump house		
Kinetic	Rotational	Rotational energies from pumps
Thermal	Heat	Heat from freeze protection heaters
Thermal	Friction	Friction heat from pumps
Thermal	Combustion	Diesel fuel oil day tank for each diesel pump
Electrical	Electric shock, electric heat	One 480 V auxiliary- lighting, ventilation, convenience, freeze protection

Table 3-4 Energy Sources of the BOF

Energy	Energy Type	Source/Quantity
Non-dangerous non-radioactive liquid waste disposal facility		
Kinetic	Rotational	Rotational energies from pumps
Thermal	Heat	Heat from freeze protection heaters
Thermal	Friction	Friction heat from pumps
Electrical	Electric shock, electric heat	Two 480 V motors and MCCs, instrumentation, auxiliary-lighting, ventilation, convenience
Access control facilities		
Kinetic	Rotational	Rotational energies associated with HVAC
Thermal	Heat	Heat from HVAC
Thermal	Friction	Friction heat from HVAC
Electrical	Electric shock, electric heat	Auxiliary power for lighting, HVAC, convenience power
Warehouse		
Kinetic	Rotational	Rotational energies associated with HVAC
Kinetic	Linear	From fork truck: several tons (ft lb_f TBD)
Thermal	Heat	Heat from HVAC
Thermal	Friction	Friction heat from active components of HVAC
Thermal	Combustion	Office supplies, paper, packing materials
Electrical	Electric shock, electric heat	auxiliary- lighting, HVAC, ventilation, convenience power
Glass Former Storage Facility		
Kinetic	Rotational	Rotational energies associated with motor driven equipment
Potential energy	Pressure or Vacuum	Pressure & Vacuum from unloading and transfer system; air receivers
Thermal	Heat	Friction heat from electric motors/compressors, heat of compression
Kinetic	Linear	Forklift
Electrical	Electric shock, electric heat	460 & 4 kV motors and associated MCC, auxiliary – lighting, convenience power

Table 3-5 Balance of Facility Risk Reduction Classification Systems

BOF Risk Reduction Classification System	Required to support:
Normal Electrical Power	a LAW Melter enclosure ventilation b LAW Secondary Offgas room ventilation c LAW Wet Process Cell ventilation
Firewater	HLW Melter enclosure protection
Instrument Air	HLW air purge into Standby Offgas System

Table 3-6 Balance of Facilities - Seismic Categories

Facility	Seismic Category
Switchgear Building	SC-IV
Balance of Facilities Switchgear Building	SC-IV
Important to Safety (ITS) Switchgear Building	SC-I/SC-II[a]
Administration Building	SC-IV
Chiller/Compressor Plant	SC-IV
Water Treatment Building	SC-IV
Cooling Tower Facility	SC-IV
Fire Water Pump House and Fire Water Storage Tanks	SC-III
Non-Dangerous, Non-Radiological Liquid Waste Disposal Facility	SC-IV
Access Control Facility	SC-IV
Warehouse	SC-IV
Glass former transfer lines	SC-IV
Glass Former Storage Facility	SC-IV

a The ITS Switchgear building foundation, battery racks, and associated supports are SC-I. The ITS Switchgear building structure HVAC and electrical duct bank are SC-II.

Table 3-7 Chemicals in the Glass Former Storage Facility

Material	Typical Silo Design Capacity (ft^3)
Silica	10,200
Zinc Oxide	2,000
Ferric Oxide	800
Zirconium Sand	900
Lithium Carbonate	3,600
Sodium Carbonate	1,500
Boric Acid	5,500
Borax	1,200
Aluminum Silicate	2,200
Titanium Oxide	1,800
Magnesium Silicate	1,100
Calcium Silicate	4,200
Sucrose	2,300

Table 3-8 Matrix of Possible Interactions of the Materials in the Glass Former Storage Facility

Materials	Silica SO_2	Zinc Oxide ZnO	Ferric Oxide FeO_3	Zirconium Sand $ZrSIO_4$	Lithium Carbonate Li_2CO_2	Sodium Carbonate $NaCO_3$	Boric Acid H_3BO_3	Aluminum Silicate Al_2SIO_4	Titanium Oxide TIO_2	Magnesium Silicate Mg_2SIO_3	Calcium Silicate $CaSIO_3$	Sucrose $C_{12}H_{22}O_{11}$	Borax $Na_2B_4O_7 \cdot 10H_2O$
Silica*		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Zinc Oxide			NR	NR	NR	NR	E	NR	NR	NR	NR	NR	NR
Ferric Oxide				NR	NR	NR	E	NR	NR	NR	NR	NR	NR
Zirconium Sand					NR	NR	NR	NR	NR	NR	NR	NR	NR
Lithium Carbonate						C1	C1	NR	NR	NR	NR	NR	NR
Sodium Carbonate*							C1	NR	NR	NR	NR	NR	NR
Boric Acid								NR	NR	E	NR	C1	C1
Aluminum Silicate*									NR	NR	NR	NR	NR
Titanium Oxide										NR	NR	NR	NR
Magnesium Silicate											NR	NR	NR
Calcium Silicate*												NR	NR
Sucrose													NR
Borax													

* - These materials were not found in the EPA database. Potential reactions were identified by review of available literature.

NR - No reaction

B1 – May cause fire

C1 – Heat generation by material reaction, may cause pressurization

E – Generates water soluble toxic products

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Attachment 2

Summary of Document Changes

Document Part	Title	Starting Page	No. of Pages
--	Summary of Document Changes	1	1

# of pages (including cover sheet): 2

Summary of Document Changes

Chapter 2

Section 2.1 corrected Glass Former Storage Facility name.
Section 2.1.1 was updated to include the Glass Former Storage Facility for this submittal
Section 2.9.11 – Glass Former Storage Facility was added

Chapter 3

3.3.2.1.2 Process and By-Product Chemicals was updated to include Tables 3-7 and 3-8 for the chemicals in the Glass Former Storage Facility
3.3.3.11 Glass Former Storage Facility was added
3.7 References was updated
Tables 3-4, and 3-6 were updated.
Tables 3-7 and 3.8 were added.